Physics Highlights from Collaboration Meeting
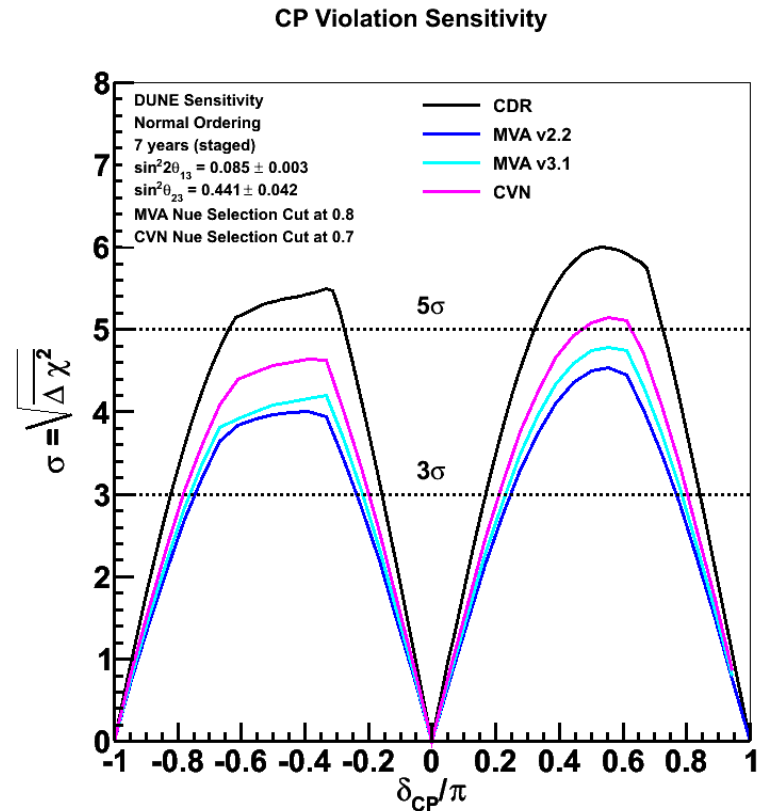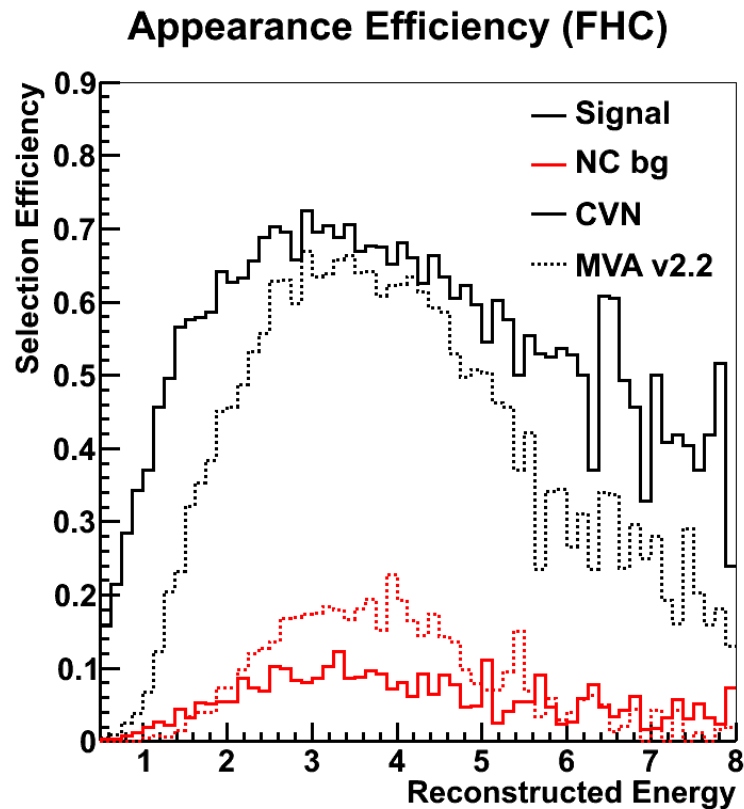
Elizabeth Worcester

DUNE Local Meeting

May 24, 2017

Mostly cut/pasted from Ryan Patterson's Physics Coordination plenary

CVN for Long-Baseline Analysis

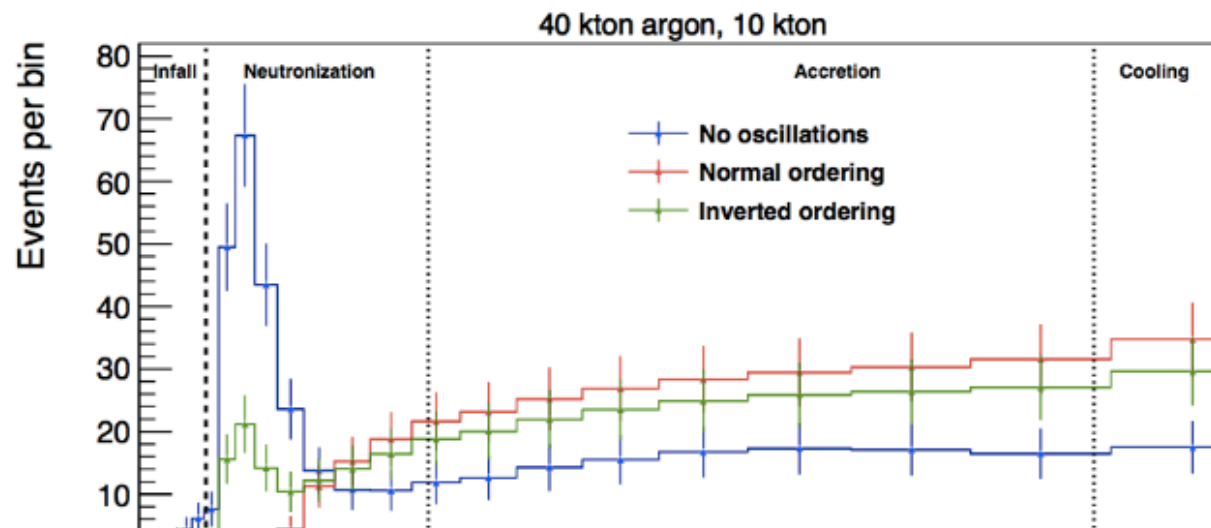Alex Radovic (William & Mary) – see "hot topics" talk in Friday plenary

SNB

**SNOwGLoBES in github**. Developers welcome.

→ *Now includes MSW flavor transitions.*

New DUNE event rate plot including flavor transitions. Showing only early times for now (which should in principle be less model dependent than later times.)

Proton Decay

- Proper simulation of kaon FSI implemented in GENIE
  - Default model (hA) does not simulate K^+ charge exchange or any other K^+ absorption. Elastic scattering model is approximate. Improved model (hN2015) includes these effects, tuned to experimental K^+ data
  - After FSI, softer kaon spectrum and presence of secondary nucleons make reconstruction and event selection more challenging and significantly different from CDR assumptions
- Kaon tracking efficiency with current reconstruction is ~80% for kaons with kinetic energy above 60 MeV but rapidly decreasing for lower energy
  - Algorithm development ongoing
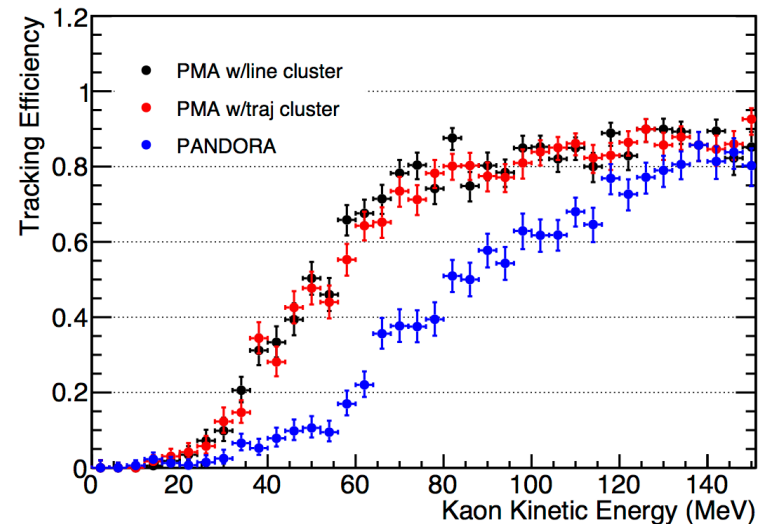
Note: PANDORA not yet tuned for the DUNE FD

Note these are track reconstruction efficiencies, selection efficiencies significantly lower – work in progress.

Physics TDR Planning

- **Physics Volume Editors:**
    Albert De Roeck
    Jon Urheim

- **Working closely with Physics Coordinators** to define initial scope, timeline, and milestones for production of the Physics Volume

TDR Timeline

TDR Physics Volume: Timeline and Milestones (DRAFT)

June 2017

High-level outline, scope, and milestones defined.
Document workflow established.

Discuss/iterate with WGs to finalize high-level picture, then…
WGs begin preparing detailed outlines and defining key plots/tables.

Aug 2017 (collab mtg)

WGs present detailed outlines.
Iteration and adjustments likely, esp. at boundaries.
For key plots/tables:
  - What technical steps are still needed to make each?
  - Planned delivery date for proof-of-principle for each?
      [Should be Jan 2018 or May 2018 in most cases]

Sept 2017

LArSoft integration complete wherever applicable
[A major milestone. Performance will evolve, but all key interfaces should be in place.]

Jan 2018 (collab mtg)

Demonstrate "Jan 2018" proofs-of-principles

TDR Timeline

May 2018 (collab mtg)   Demonstrate "May 2018" proofs-of-principles

Also, checkpoint/review of all high-level scientific goals.
For each:
     Achieved? Clear path by Jan 2019?
     Alternative strategies required?

Text writing starts ramping up

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Sept 2018 (collab mtg)   Supplemental internal documentation ready for review
(Requirements TBD. The idea is to give the collaboration enough detail on each analysis to properly vet the results.)

Text writing well underway

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Jan 2019 (collab mtg)   Analyses frozen. Final plots and numbers assembled.

Feb 2019   Begin internal review of complete draft

April 2019   Final version ready for external review`

Calibration

- Low-level calibrations will be responsibility of appropriate consortia
- Track-level calibrations cut across consortia – should be in a physics working group
  - Current idea is to transform cosmogenics working group to cosmogenics/calibrations working group
  - Ryan and I are talking with existing conveners and trying to identify potential calibrations-focused convener
- Detector TDR (as currently conceived) will describe a far detector with no calibrations hardware – physics TDR must demonstrate we can calibrate the detector sufficiently well for the required physics performance w/o such hardware